DRAFT ASSESSMENT SCHEDULE – For planning purposes only

Physics 2.3: Demonstrate understanding of waves

Assessment Criteria

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrates understanding of waves by: • writing statements that show an awareness of how simple facets of phenomena, concepts or principles relate to a described situation • solving straightforward mathematical problems.	*Demonstrates in-depth understanding* of waves by: • writing statements that show understanding of how phenomena, concepts or principles relate to given situations • using information that is not immediately obvious or directly usable for mathematical statements.	*Demonstrates comprehensive understanding* of waves by: • writing statements that show understanding of why phenomena, concepts or principles relate to given situations • written descriptions will demonstrate understanding of connection between concepts including graphs and diagrams • using mathematical solutions that demonstrate understanding of connection between concepts.

Evidence Statement

One	Not achieved		Achievement		Achievement with Merit		Achievement with Excellence	
	N0 N1	No evidence ONE correct	A3	TWO correct	M5	TWO correct	E7	ONE correct
	N2	TWO correct	A4	THREE correct	M6	THREE correct	E8	TWO correct
(a)	One has to look into the mirror to see a virtual image Identifies EITHER mirror correctly.		States that a virtual image cannot be formed on a screen. States that a virtual image is formed by the apparent intersection of rays.		States OR illustrates that a diminished virtual image is formed on a convex mirror. States OR illustrates that an enlarged virtual image is formed in a concave mirror.		States that although a concave mirror is a converging mirror the object is located between the focal point and the mirror. This means that rays emanating from a certain position on the object diverge on the reflection and will not meet. These reflected rays would intersect if they were extended behind the mirror, giving an enlarged, virtual image.	
(b)	Draws a ray parallel to the principal axis.		Draws a convex mirror. Places the focal point behind mirror.		Completes an accurate ray diagram. **(See Appendix One).**			
(c)	Recognises the mirror formula: $\frac{1}{d_i}+\frac{1}{d_o}=\frac{1}{f}$ Recognises that magnification is: $\frac{d_i}{d_o}$		Uses formula for mirror correctly with focal length as negative, including correct transposing to make $\frac{1}{d_i}$ as subject of the formula: $\frac{1}{d_i}=\frac{1}{-.75}-\frac{1}{5.4}$		Calculates the image distance correctly: d_i=0.66 m		Calculates the magnification accurately: $m=\frac{0.66}{5.4}$ $m=0.12$	

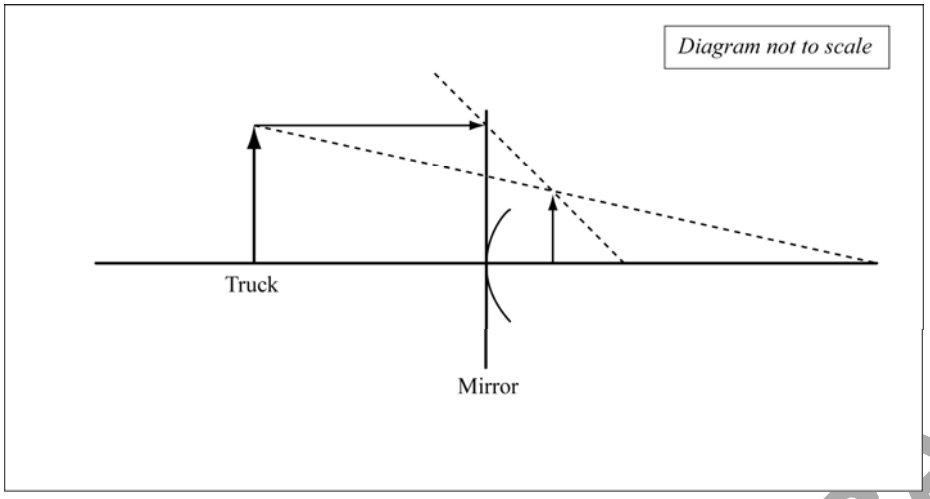
Two	Not achieved		Achievement		Achievement with Merit		Achievement with Excellence	
	N0 N1	No evidence ONE correct	A3	TWO correct	M5	TWO correct	E7	ONE omission
	N2	TWO correct	A4	THREE correct	M6	THREE correct	E8	TWO correct (answers)
(a)	Sandy can see the coin once water is poured into the beaker.		Describes OR draws a diagram, without details of refraction of light, to show that the coin appears raised.		Completes an accurate diagram OR explanation to show the coin appears raised because light bends as it goes from the water to the air. **(See Appendix Two).**		Connects the coin appearing raised to the light speeding up when going from water to air. Explains and/or illustrates that air is optically less dense as compared to water. The eye cannot see light bending and so it appears to come from a point higher than the bottom of the beaker.	
(b)	Draws the normal. Recognises that the angle of incidence is between the normal and the incident ray.		States the angle of incidence = 40° and the refractive index of air = 1.00.		Accurately completes the calculation: $\lambda_{water} = \frac{1.00 \times 720 \times 10^{-9}}{1.33}$ $\lambda_{water} = 5.41 \times 10^{-7}\text{m}$			
(c)	States the critical angle as the angle of incidence in water.		Describes (OR shows by means of a diagram) the critical angle as the angle of incidence in water for a ray travelling from water to air for which the angle of refraction is 90°.					
(d)	$n_w \sin\theta_w = n_{air} \sin\theta_{air}$		Selects the correct formula and attempts the calculation with minor error(s).		Accurately completes the calculation and includes the correct unit. $\sin\theta = 1.00 \sin 90 / 1.33$ $\theta = \sin^{-1}(1.00 \sin 90 / 1.33)$ $\theta = 49^\circ$			
(e)	States that the angle of refraction increases.		Describes (OR shows by means of a diagram) that no light will enter the air as it is all reflected back into water, and the angle of incidence is equal to the angle of reflection.		Explains the total internal reflection, with the angle of incidence = angle of reflection (and shown in a diagram).			

Three	Not achieved		Achievement		Achievement with Merit		Achievement with Excellence	
	N0 N1	No evidence ONE correct	A3	TWO correct	M5	TWO correct	E7	ONE correct
	N2	TWO correct	A4	THREE correct	M6	THREE correct	E8	TWO correct
(a)	States that they hear loud and soft sounds.		Describes that sounds waves interfere with each other producing loud and soft sounds.		Explains that areas where there is constructive interference produce loud sounds. Explains that areas where there is destructive interference produce soft sounds.		Explains constructive interference is produced when waves that are a whole wavelength apart interfere. Explains destructive interference is produced when waves that are half a wavelength apart interfere.	
(b)	States that the wavelength is smaller		States that waves travel faster in deep water and slower in shallow water AND since the wave speed decreases, wavelength also decreases.		Explains that since $v = f\lambda$, as speed decreases, wavelength decreases as the frequency of the wave does not change.			
(c) (i) – (iii)	$v = \frac{d}{t}$ $d = 330 \times 8.4$ d = 2772 m		Calculates the distance accurately: $d = \frac{330 \times 8.4}{2}$ d = 1386 m		Explains that the pitch of a note depends on frequency. Since the frequency does not change on reflection in the same medium, the pitch will be the same.		Connects the relationship between: • the speed of sound increasing as is now travels through water, and so the echo will be heard sooner • the pitch of the sound remaining the same, as the frequency stays the same.	

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
Minimum of 2A	Minimum of 2M	Minimum of 2E

Appendix One – Question One (b)



Appendix Two – Question Two (a)